

**Final Summary of ICCR Source Work Group Meeting
November 20, 1997
Internal Combustion Engines Work Group Meeting**

I. Purpose

The main objectives of the meeting were the following:

- Update on Preliminary MACT Floor
- Presentation on Model Plants Development
- Subgroup Status Reports
- Selection of Pollution Prevention Subgroup Representative
- Selection of Economic WG Liaison

II. Location and Date

The meeting was organized by the Environmental Protection Agency (EPA) and was held at the Red Lion Hotel in Houston, Texas. The meeting took place on November 20, 1997.

III. Attendees

Meeting attendees included representatives of the OAQPS Emission Standards Division, trade associations, universities, and state agencies. A complete list of attendees, with their affiliations, is included as Attachment I.

IV. Summary of Meeting

The meeting consisted of discussions between WG members on selected issues which are listed below. The order of the meeting followed the agenda provided in Attachment II. A bullet point summary of the meeting is presented as Attachment III.

The topics of discussion included the following:

- Environmental Representation on the RICE WG
- Improvements to the ICCR Process
- Results of the Test Plan Presentation to the CC
- Report on CC Meeting
- Summary of WSPA CARB data analysis
- Economic Analysis WG Presentation on Model Plants Development
- Population Subgroup Report
- Pollution Prevention Representative
- Emissions Subgroup Report
- New Source MACT Subgroup Report

- Next Meeting Issues

Environmental Representation on the RICE WG

Ross Vincent of the Coordinating Committee volunteered to be the environmental representative for the RICE WG. He still has to go through the nomination process before becoming an official member.

Improvements to the ICCR Process

Amanda Agnew made a short presentation on the ICCR Satisfaction Survey results. This presentation is included as Attachment IV. The following point was highlighted:

- When presenting WG decisions to the CC, majority and minority opinions will be formed if there is dissension between the CC and the source WG on any issues. Each WG's consensus on issues, as well as the CC's comments on these issues, will be submitted to EPA.

Results of the Test Plan Presentation to the CC

Sam Clowney presented a report on the results of the presentation of the Test Plan to the CC. This presentation is included as Attachment V. The following points were emphasized:

- One CC member pointed out that landfill gas fired engines are not being represented in the Test Plan. These engines are part of the 5% of engines in the RICE Population Database which utilize other fuel types.
- An environmentalist representative of the CC raised the question of including particulate matter as a pollutant for testing on natural gas fired engines.
- Sam Clowney suggested that the RICE WG document all rebuttals to these comments from the CC and keep moving forward.
- Charles Elder pointed out that the CC should know that the RICE Population Database only represents 28,000 engines, not the total population of engines. Bob Stachowicz requested that the RICE WG estimate a total population of engines.
- Vick Newsom expressed that the total population of engines will not make any difference to environmentalists; they will always bring up the issue of dioxin, no matter how many engines are affected.
- It was decided that Alpha-Gamma would provide a breakdown of engines by fuel type represented in the remaining 5% of the RICE Population Database (95% being diesel and natural gas fired units). Alpha-Gamma will add the AMSA data to these statistics.

Report on CC Meeting

Vick Newsom gave a brief synopsis of the November 18-19 CC Meeting. A copy of the CC Meeting flash minutes is available on the TTN. The following points were accented:

- The ICR brought in data for non-fossil fuel types. There are reported HAPS data for engines.
- It was decided that Alpha-Gamma would look at the emissions test reports for non-fossil fuels.

Summary of WSPA CARB Data Analysis

Vick Newsom gave a brief summary of the WSPA CARB Data Analysis presentation. The presentation handouts will be available on the TTN. Major thoughts presented included:

- API/EER stated that they corrected emissions tests from 6 orders of magnitude spread to one order of magnitude, for engines.
- Sam Clowney requested copies of the source test reports, but API/EER stated that these reports cannot be provided due to confidentiality agreements with the industry.
- Brahim Richani asked if a comparison had been made between EPA's emissions database and API's. API stated that the API database is more comprehensive with 30 source tests. API sought additional design data from the sources, with many reports from AB 2588. Ed Torres thought that this data would be identical to that which he submitted to EPA. API pointed out that their data are for the petroleum industry only.
- Chuck Elder questioned the confidentiality of these reports. Mike Horowitz stated that EPA can insist on performing testing on any location in order to get emissions data, which would be public knowledge. However, process data may still be confidential.

Economic Analysis WG Presentation on Model Plants Development

The Economic Analysis WG made a presentation on model plant development. This presentation is included as Attachment VI.

- Vick Newsom and Wayne Hamilton requested more information from the Economic Analysis WG, such as a sample model plant for another MACT development process, to get examples of what parameters are needed for developing the RICE model units.

- Darrell Bowen stated that the shortcomings of the RICE Population Database was a concern. The Economic Analysis WG suggested working around flaws in the database, making corrections by weighing certain data points more than others when necessary.
- Darrell Bowen wanted more information on the definition of "small businesses." The Economics Analysis WG will provide this information to the WG.

Population Subgroup Report

Wayne Hamilton made a brief presentation on the status of the Population Subgroup. He gave an update on the following points:

API: Oil and Gas Industry Database

Mike Milliet presented a comparison of the API and EPA RICE Population Databases, included as Attachment VII.

- Bryan Willson raised a concern that the population must, for the most part, represent major sources, because he thinks the 2 stroke engines are over-represented.
- Vick Newsom does not think the two databases have much overlap; that the API data for the most part do not represent major sources since they were grandfathered in. Therefore the fact that the two databases show the same statistics shows that they are representative of the petroleum industry.
- Wayne Hamilton suggested that the Population Subgroup provide a breakdown by SIC on total population, based on a ramp-up utilizing the API database.

INGAA Comments on the RICE Population Database

INGAA comments on the RICE Population Database were provided to the Population Subgroup on November 7.

- These comments will be addressed in writing by December 5 by Alpha-Gamma and will be provided to the RICE WG.
- A Population Subgroup teleconference will be held on December 9 at 2 p.m. Central Time.

INGAA Make and Model Principles

INGAA suggested some generalization principles about makes and models in the database which need to be approved by the Engine Manufacturers' Association.

- Don Dowdall will respond to Alpha-Gamma by December 1 with

- consensus on these principles by the EMA.
- Alpha-Gamma will provide Don Dowdall the list of makes and models with unknown parameters. He will distribute these to the EMA and provide the missing data to Alpha-Gamma by December 1.

Power Systems Research

Alpha-Gamma attempted on several occasions to obtain information from Power Systems Research regarding their non-road engines population database. Alpha-Gamma received a list of data fields of the Power Systems Research Database shortly before the meeting. Data received from Power Systems Research will be discussed during the next Population Subgroup teleconference.

TNRCC Engine Classification

Randy Hamilton researched the Texas engines which were suspected to be misclassified as 4 stroke lean burn engines. He determined that nearly all 48 engines are rich burn engines, due to a mistake in the SCC assigned by TNRCC. Alpha-Gamma will correct these engine designations in the RICE Population Database.

Distribution of Engines Data

Bryan Willson was in the process of gathering data in order to estimate the actual population of engines utilizing catalysts. He contacted Michael Wax of the Institute of Clean Air Companies to determine the percentage of engines with catalysts based on market data. He will provide this data to Wayne Hamilton of the Population Subgroup.

Subcategorization and Model Plants

- Wayne Hamilton suggested forming a new subgroup to determine model units and plants for the RICE WG.
- Bob Stachowicz expressed concern on waiting any longer to determine subcategories. He felt that the RICE WG can definitely determine subcategories such as ignition type, stroke and burn type. Other issues like small business subcategories still need work, but a preliminary determination can be made. Chuck Elder agreed with Bob in the need to move forward. He suggested that the WG determine subcategories, and document why certain assumptions were made about the database. Bob Stachowicz suggested internalizing the determination of subcategories at least as a first step.

- Don Price suggested subcategorizing by use, i.e. generator, gas compression, or pump. This would require a difference in emissions depending on the use of the engine.
- Ed Torres suggested that the RICE WG define size cutoffs for engines to be controlled above the MACT floor.
- Jay Martin raised a concern about time constraints.
- Ed Torres suggested addressing size issues and cutoffs as well as types of engines for subcategorization.
- Sam Clowney disagreed with the urgency to proceed with determining subcategories, since other WG's are behind the RICE WG as far as timelines are concerned.
- Mike Horowitz stated that the RICE database is a great data source, since in the past, EPA has been able to use less data to determine MACT standards. In addition, the RICE Population database firms up the beliefs of the RICE WG of the controls placed on engines in the real world. He stated that the WG cannot presume that the data are not good enough. The API data show that the EPA database is not skewed, or at least the two databases are skewed in the same way.
- Michael Horowitz also pointed out that subcategories should not be based on control information, but on technology and emission variations.
- Mike Milliet suggested that if a subgroup is formed to address model plants, the head of this group should be the Economic Analysis WG liaison.
- Don Price volunteered to be the Economic Analysis WG liaison for the RICE WG.
- Alpha-Gamma will incorporate the AMSA information in the MACT floor determination.

Pollution Prevention Representative

It was decided that Sam Clowney will serve as the Pollution Prevention Representative for the RICE WG on the Coordinating Committee Subgroup.

Emissions Subgroup Report

Sam Clowney presented an update of the status of the Emissions Subgroup. This is included as Attachment V. He also passed out a summary of the next steps for the WG. This is included as Attachment VIII.

- Bryan Willson made a presentation on the Engines and Energy Conversion Laboratory at Colorado State University. This is included as Attachment IX.
- Peter Hill of the Combustion Turbine WG and the Department of the Navy provided a memo to the RICE WG with available engines for testing belonging to the Navy. This is provided as

Attachment X. The discussion of which engines to use for testing will be continued in an Emissions Subgroup teleconference on November 25.

- Don Dowdall suggested that another option would be to rent a skid-mounted engine to bring to CSU for testing.
- Bryan Willson noted the need for obtaining good aged catalysts for use during tests. The Emissions Subgroup will look into obtaining aged catalysts for emissions testing.
- Bob Stachowicz and Amanda Agnew both expressed the need for a presence of an EPA representative during the engine testing.
- As far as Cummins engines are concerned, Mike Brand said that the best option provided by the Navy is the KTA 2300, since it is skid-mounted, older and more popular, and the other Cummins engine is a joint effort with Komatsu.
- The Emissions Subgroup will verify sites for emissions testing.
- The Emissions Subgroup will apply the TMPWG Guidance to the Emissions Database.
- The Emissions Subgroup will provide recommendations on revisions to engines in the Test Plan to the RICE WG.
- Sam Clowney will set up an Emissions Subgroup Teleconference for November 25, at 2 p.m., EST.
- Amanda Agnew will start the paperwork on the Test Plan.

New Source MACT Subgroup Report

There has been no progress in the New Source MACT Subgroup. Bill Passie will report on the progress of this subgroup at the next meeting.

Next Meeting Issues

- If a meeting is necessary between now and the February CC meeting, it will be held on January 15th in New Orleans, Louisiana.
- The next definite meeting will be on February 26 in Winston Salem, NC, following the February 24-25 CC meeting. The following meeting on schedule is in Fort Collins, Colorado, on April 30.
- Agenda Items for the next meeting include:
 - *Presentation to WG on MACT floor
 - *Presentation on final Test Plan
 - *News on funding Test Plan

These minutes represent an accurate description of matters discussed and conclusions reached and include a copy of all reports received, issued or approved at the November 30 meeting of the Reciprocating Internal Combustion Engines WG. Amanda Agnew

ATTACHMENT I

LIST OF ATTENDEES

Stationary Internal Combustion Engines Work Group Meeting
Houston, Texas
November 20, 1997
List of Attendees

| | |
|------------------|---|
| Amanda Agnew | EPA OAQPS Emissions Standards Division |
| Darrell Bowen | CNG Transmission Corporation |
| Michael Brand | Cummins Engine Company, Inc. |
| Sam Clowney | Tenneco Energy |
| Donald Dowdall | Engine Manufacturers Association |
| Charles Elder | General Motors Corporation |
| Randy Hamilton | Texas Natural Resources Conservation Commission |
| Wayne Hamilton | Shell E&P Technology Company |
| Michael Horowitz | EPA Office of General Counsel |
| Jay Martin | University of Wisconsin-Madison |
| Michael Milliet | Texaco E&P Inc. |
| Vick Newsom | Amoco Production Section |
| Donald Price | Ventura County Air Pollution Control District |
| Bob Stachowicz | Waukesha Engine Division |
| Ed Torres | Orange County Sanitation District |
| Jorge Torres | Natural Gas Pipeline of America |
| Bryan Willson | Colorado State University |
| Jan Connery | Eastern Research Group |
| Brahim Richani | Alpha-Gamma Technologies |
| Jennifer Snyder | Alpha-Gamma Technologies |
| Linda Coerr | Coerr Environmental |
| Walt Brown | Economics Work Group |
| Mahesh Gundappa | Radian International |
| Jim McCarthy | GRI |
| Bill Ergenbright | Tennessee Gas Pipeline |

| | |
|----------------|---------------------------------|
| Mike Gallaher | Economic Analysis WG |
| Glenn Sappie | Economic Analysis WG |
| Tom Walton | Economic Analysis WG |
| Tim Hunt | American Petroleum Institute |
| David Hansell | EER |
| Jenny Craig | Environmental Protection Agency |
| Terry Harrison | TMPWG |
| Jocelyn Siegel | ABT Association |
| Peter Hill | Combustion Turbine WG |

ATTACHMENT II

AGENDA FOR THE NOVEMBER 20 RICE WG MEETING

Revised Agenda
Reciprocating Internal Combustion Engine Work Group
November 20, 1997 Work Group Meeting
Red Lion Hotel-Houston, Texas

MEETING GOALS: Update on preliminary MACT floor
 Presentation on Model Plants Development
 Report from each subgroup on status

| | |
|---------------|---|
| 8:00 – 8:10 | Welcome, Meeting Goals (A. Agnew) Agenda Review (J. Connery) |
| 8:10 – 8:40 | Improvements to the ICCR Process (A. Agnew) |
| 8:40 – 9:00 | Discussion of previous rule developments and projects under FACA (M. Horowitz) |
| 9:00 – 9:15 | Report on Coordinating Committee Meeting (V. Newsom) |
| 9:15 – 9:30 | Summary of the Western States Petroleum Association (WSPA) CARB data analysis (V. Newsom) |
| 9:30 – 9:45 | BREAK |
| 9:45 – 10:45 | Economics WG Presentation on Model Plants Development (T. Walton, G. Sappie, M. Gallaher, J. Mackell) -Discussion -Selection of WG liaison for Economics WG |
| 10:45 – 11:45 | Population Subgroup Report (W. Hamilton) Review of Changes to Preliminary MACT Floor Since Last Meeting Discussion of Population DataBase Refinements (Alpha-Gamma) |
| 11:45 – 12:15 | WORKING LUNCH |
| 12:15 – 1:15 | Emissions Subgroup Report (S. Clowney) |
| 1:15 – 1:45 | Project funding options and test sites update (A. Agnew) |
| 1:45 – 2:00 | BREAK |
| 2:00 – 2:30 | New Source MACT Subgroup Report (B. Passie) |
| 2:30 – 2:50 | Next Meeting: Schedule and Tentative Agenda Items (J. Connery) |
| 2:50 – 3:00 | Review of Flash Minutes (J. Connery and J. Snyder) |
| 3:00 pm | ADJOURN |

ATTACHMENT III

BULLET POINT SUMMARY

Summary of ICCR Source Work Group Meeting, November 20, 1997
Internal Combustion Engines Work Group Meeting
Red Lion Hotel, Houston, Texas

Decisions

- Sam Clowney will represent the RICE WG on the Pollution Prevention Subgroup.
- Don Price will represent the RICE WG as the Economics Analysis WG liaison.

Next Meeting

- If a meeting is necessary between now and the February CC meeting, it will be held on January 15th in New Orleans, Louisiana.
- The next definite meeting will be on February 26 in Winston Salem, NC, following the February 24-25 CC meeting. The following meeting on schedule is in Fort Collins, Colorado, on April 30.
- Agenda Items for the next meeting include:
 - *Presentation to WG on MACT floor
 - *Presentation on final Test Plan
 - *News on funding Test Plan

Action Items

- A. Agnew: Start paperwork on Test Plan.
- B. Passie: Update RICE WG on New Source MACT Subgroup status.
- Economics WG: Provide website of definition of small businesses to RICE WG.
- EMA/Don Dowdall: Come to a consensus on whether to accept general principles provided by INGAA on Population database by December 1.
- Bryan Willson: Contact W. Hamilton about ICAC (Institute of Clean Air Companies) data regarding population information.
- Emissions Subgroup: Verify sites for emissions testing.
- Emissions Subgroup: Apply TMPWG guidance to emissions database.
- Emissions Subgroup: Set up conference call for 11/25 at 2 p.m. EST.
- Emissions Subgroup: Provide recommendations on revisions to engines in Test Plan to RICE WG.
- Emissions Subgroup: Look into obtaining aged catalysts for engine testing.
- Alpha-Gamma: Provide WG with unknown makes and models in Population database.
- Alpha-Gamma: Provide written response to INGAA's comments to WG by December 5.
- Alpha-Gamma: Incorporate AMSA information in MACT floor determination.
- Alpha-Gamma: Emissions test reports: non-fossil fuels.
- Population Subgroup: Set up conference call for December 9 to discuss INGAA's comments.
- Population Subgroup: Provide breakdown of remaining 5% fuel types to Sam, Amanda and Vick by 11/26 (including AMSA information).
- Population Subgroup: Incorporate Texas 4SLB engine changes to 4SRB.

ATTACHMENT IV
SATISFACTION SURVEY RESULTS

Outline

- Satisfaction Survey
 - » Coordinating Committee
- ICCR Process
 - » Return to process in document
 - » Review roles and responsibilities

1

Responsible for Administrative Management of Process

- ICCR Administrative Management Team
 - » EPA Co-Chair(s)
 - » Stakeholder Co-Chair(s)
 - » Facilitator(s)
- Suggestions for improved coordination among Work Groups

2

Satisfaction Survey OUTLINE

- Rate your satisfaction with process on scale of 1-5
- Explain basis for your rating
- If could “change” something in process, what would you change?

3

Results of Satisfaction Survey IN GENERAL

- 1/3 of members responded
- little difference between CC and WG responses
- average rating of 3
- comments not consistent with rating
- more realistic rating of 2

4

Results of Satisfaction Survey

BASIS OF RATING

- Process is moving too slowly
- Discussions go “on and on” without consensus or closure
- Coordinating Committee is micro-managing Work Groups

5

Results of Satisfaction Survey

SUGGESTIONS FOR CHANGES

- Discussions need to recognize non-consensus situations; reach closure and move on
- EPA needs to take a leadership role; exert more control; focus ICCR process; and define scope of ICCR

6

Results of Satisfaction Survey

RETURN TO DOCUMENT

- Basis of rating and suggestions are related
- Suggestions “mirror” process outlined in ICCR document
- Process has not been operating consistent with the ICCR document

7

Roles and Responsibilities

SOURCE WORK GROUPS

- Gather and review information
- Identify data gaps and fill them
- Identify subcategories
- Identify preliminary MACT floors
- Identify control technologies, pollution prevention techniques and work practices
- Identify regulatory alternatives
- Analyze impacts of each regulatory alternative
- Provide input to Economic Analysis Work Group

8

Roles and Responsibilities

SOURCE WORK GROUPS (continued)

- Consider incremental environmental and public health benefits, as well as incremental cost, economic and energy impacts associated with each regulatory alternative
- Brief CC and consider CC feedback / guidance
- Present regulatory recommendations, with supporting rationale, to the CC
- If consensus is not reached, present majority and minority opinions
- Meet as appropriate

9

Roles and Responsibilities

COORDINATING COMMITTEE

- Establish ICCR organization and procedural ground rules
- Establish overall schedule
- Meet as appropriate
- Review and discuss information provided by each WG
- Communicate inconsistencies or common issues with affected WG's and facilitate resolutions
- Track whether overall schedule is being met
- Track whether issues are being resolved
- Maintain big-picture perspective on reg. development
- Provide feedback / guidance to WG's to ensure consistency and thoroughness
- Coordinate between WG's

10

Roles and Responsibilities

COORDINATING COMMITTEE (continued)

- Review / consider Work Group regulatory recommendations
- Develop and present regulatory recommendations and supporting rationale to EPA management
- If consensus is not reached, present majority and minority recommendations

11

Roles and Responsibilities

WG STAKEHOLDER CO-CHAIR

- Unique feature and position within ICCR process
- Responsible for representing views of ENTIRE Work Group - not his/her own views
- All other members of the CC represent the views of their stakeholder interest

12

Roles and Responsibilities

STAKEHOLDER CO-CHAIR (continued)

- WG Stakeholder Co-chair must represent entire SWG on CC
- WG Stakeholder Co-chair is an “equal” member of the CC
- Ensures SWG recommendations are among those the CC provides to EPA

13

Results of Satisfaction Survey

BASIS OF RATING

- Process is moving too slowly
- Discussions go “on and on” without consensus or closure
- Coordinating Committee is micro-managing Work Groups

14

Results of Satisfaction Survey

SUGGESTIONS FOR CHANGES

- Discussions need to recognize non-consensus situations; reach closure and move on
- EPA needs to take a leadership role; exert more control; focus ICCR process; and define scope of ICCR

15

Changes in Process

GENERAL

- Return to model for process outlined in ICCR document
- Changes in Facilitation
- EPA will take a leadership role

16

Changes in Process

RETURN TO MODEL

- Highlight / emphasize roles and responsibilities of CC versus WG's
- Highlight / emphasize roles and responsibilities of WG Stakeholder Co-chairs
- Where consensus does not emerge, reach closure by recognizing non-consensus - elevate issue for resolution - and move on

17

Changes in Process

FACILITATORS AND CO-CHAIRS

- Stronger Co-chair role with Facilitators
- Facilitators and Co-chairs need to:
 - » minimize repetition
 - » recognize non-consensus
 - » reach closure and move on
- Facilitator, EPA Co-chair and Stakeholder Co-chair to work together to determine best approach for WG and CC

18

Changes EPA ROLE

- EPA will take more of a leadership role - particularly on the WG's
- EPA will focus process by defining scope of ICCR within each SWG
- EPA will identify specific activities which need to be accomplished within each SWG
- EPA will continue to “leverage” resources with other stakeholders to accomplish activities within each SWG

19

Changes ROLE OF EPA CO-CHAIRS

- EPA's obligation to develop regulations
- Will come prepared with what EPA has identified needs to be done
- Will still look for WG members to perform work and provide input
- Where others fail to come forward to accomplish activities, EPA will accomplish those activities EPA determines are important

20

Digress for a Moment

STAKEHOLDER CONTRIBUTIONS

- EPA not seeing resource “leveraging” we hoped to achieve in ICCR process
- There are some exceptions to this
- Some stakeholders are investing and contributing substantial resources to ICCR process
- EPA would like to see all stakeholders begin to contribute

21

Digress for a Moment

MEMBERSHIP vs. PARTICIPATION

- There is a difference between “participation” and “membership”:
 - » process designed to have an unlimited number of participants -involved to varying levels, no expectations
 - » membership is unique, carries expectations and responsibilities
 - » worth reviewing membership criteria from ICCR document
- Low response to survey is telling - many members are observing, not working

22

Digress for a Moment

RESPONSIBILITIES OF MEMBERS

- Attend all meetings
- Commit significant amount of time (20-25%)
- SWG members: time and resources to undertake, perform, & review regulatory development tasks
- CC members: time to review WG materials, participate in subgroups, communicate between meetings
- Would like all members to contribute

23

Changes

CC MICRO-MANAGEMENT

- Emphasize roles of CC and SWG's
- In addition?
 - a: fewer meetings?
 - b: different types of meetings?
 - conventional and administrative
 - c: plant tours?
 - d: primers?
- Wait and See

24

November 3 Meeting

IMPROVE COORDINATION AMONG WGs

- Currently, CC and EPA Co-chairs provide coordination
- Suggestion: Bring Stakeholder Co-chairs and EPA Co-chairs together periodically
- Looking for feedback

25

Conclusion

SATISFACTION SURVEY

- Member response
 - » somewhat dissatisfied with process
 - » frustrated to some extent
- Basis for response
 - » process moving too slowly
 - » discussions go on-and-on
 - » Committee micro-managing
- Changes desired
 - » return to model process in ICCR document
 - » bring discussions to closure - consensus where possible - and move on
 - » EPA take leadership role in process

26

ATTACHMENT V

EMISSIONS SUBGROUP REPORT

Emissions Subgroup Report

Presented to:

Reciprocating Internal Combustion Engine Work Group
Houston, Texas

Presented by:

Sam Clowney, Tennessee Gas Pipeline

November 20, 1997

Topics

- Coordinating Committee Action on Test Plan
- Next Steps to Conduct Testing
 - Submittal of Plan and Request for Funding
 - Selection of Test Sites
- Next Steps for Engines Not Addressed by Plan
- HAP Tests for RICE Reported in ICR Responses
- Guidance from the Testing and Monitoring Protocol Work Group

CC Action on Test Plan

- CC did not reach consensus on the Test Plan
- CC agreed to forward the Test Plan to EPA, along with majority and minority views
 - Majority position:
 - Proposed Test Plan should be conducted
 - Minority position:
 - Additional testing should be conducted for fuels other than natural gas and diesel fuel
 - Dioxin testing should be conducted for RICE using landfill gas
 - PM should be included for gaseous fuels as indicator of “good combustion”

Next Steps to Conduct Testing (1)

- Next Steps for Coordinating Committee
 - Minority and majority positions to be drafted no later than first week of December and then circulated to Coordinating Committee for review
 - Test Plan to be transmitted to EPA, with majority and minority positions in December
- Next Steps for EPA
 - EPA to consider request for funding for these tests
 - EPA to provide Work Group feedback on funding for testing to be conducted

Next Steps to Conduct Testing (2)

- Next Steps for RICE Work Group
 - Work Group was instructed to proceed based on:
 - Work Group's consensus on the Test Plan
 - Need for progress to meet schedule
 - Final decision to use CSU facility,
no objections from CC
 - Evaluation of possible host sites for diesel unit

Engines Not Addressed by Test Plan

- Work Group has discussed possibility of additional testing for other fuels if additional funds were available
- Minority position of CC is that there should be a commitment to conduct additional tests
- Absence of additional test data may have consequences for the Work Group's ability to make decisions about MACT for fuels other than natural gas and diesel

Next Steps for Engines Not Addressed by the Test Plan

- Suggestions for Work Group Consideration:
 - Assessment of engines not covered by current test plan (not covered means cannot take results and apply them to those engines)
 - Types of fuels not covered
 - gasoline, crude/residual oil, kerosene/naphtha, digester gas, landfill gas, process gas, LPG, propane, non-fossil/waste fuels, multiple fuel engines
 - Types of engines not covered
 - dual fuel engines
 - Evaluation of possible MACT outcomes with or without additional testing

HAP Tests Reported in ICR Responses (1)

- On the ICR, 52 respondents indicated they have HAP test reports for RICE using non-fossil fuels
- In addition, 2,280 fossil-fired units have HAP test reports -- some may be RICE
- EPA and Coordinating Committee recommended that Work Groups review the ICR information to determine if these test reports can fill data gaps

HAP Tests Reported in ICR Responses (2)

- Suggestions for Work Group consideration:
 - Request that Alpha-Gamma provide the Emissions Subgroup a list of the 52 test reports that are available for RICE using non-fossil fuels
 - Request that Alpha-Gamma identify those reports included in the ICR responses that are not already in the database
 - Emissions Subgroup to review list and determine which reports should be retrieved

T&M Work Group Guidance

- T&M Work Group has issued three guidance documents that may be useful to RICE Work Group in their review of emissions data:
 - Formaldehyde Measurements by DNPH Methods
 - Interpreting and Using Emissions Databases Containing Non-detection Values
 - Review of ICCR Emissions Database

Formaldehyde Measurements by DNPH Methods (1)

- T&M reviewed use of DNPH methods to measure formaldehyde at request of RICE Work Group
- T&M identified two factors that could cause DNPH methods to fail to report accurate formaldehyde levels
 - more than 60 ppm NO₂
 - large sampling volume
- Conclusion: In absence of specific information about NO₂ levels and sampling volumes, it is likely DNPH-based methods underestimate formaldehyde emissions from lean or clean burn engines

Formaldehyde Measurements by DNPH Methods (2)

- Suggestions for Work Group consideration:
 - Accept T&M guidance for all fuels
 - In absence of specific information about NO₂ levels and sampling volumes, it is likely DNPH-based methods underestimate formaldehyde emissions from lean or clean burn engines
 - Apply T&M guidance to RICE Emissions Database
 - Identify which units in the database are lean or clean burn
 - Identify formaldehyde data that may be too low due to interference with DNPH-based methods

Guidance on Interpreting Non-Detects (1)

- T&M Work Group reviewed use of non-detects included in EPA Emissions Databases for ICCR
- Recommendations:
 - T&M believes that any decision to control HAP emissions from combustion sources should be made on the basis of fuel composition, combustion science, and actual observations
 - No decisions leading to the imposition of control devices or emission limits on combustion processes should be made that are based on emission levels derived from default HAP concentrations calculated from method detection levels
 - Six-step procedure to evaluate non-detect data in EPA database

Guidance on Interpreting Non-Detects (2)

- Suggestions for Work Group Consideration:
 - Accept T&M recommendations
 - No decisions leading to the imposition of control devices or emission limits on combustion processes should be made that are based on emission levels derived from default HAP concentrations calculated from method detection levels
 - Use 6-step process to evaluate existing non-detect data, including use of 1/2 of detection limits for existing data
 - Carefully document when non-detects are present to ensure that MACT decisions are not made based on non-detect values

Review of ICCR Emissions Database (1)

- T&M Work Group developed guidance on review of existing emissions data in ICCR Database
- Recommendations:
 - Conduct a 2-tier analysis of emissions data
 - Tier 1 to review critical process data such as basic device information, fuel data flow rate and operating parameters
 - Tier 2 to review quality assurance methods
 - Define levels of report quality
 - Unacceptable, acceptable upon condition that additional data is obtained, and acceptable

Review of ICCR Emissions Database (2)

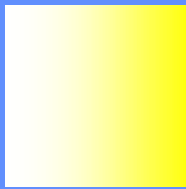
- Suggestions for Work Group Consideration:
 - Accept T&M Guidance
 - Data in RICE Emissions Database should be reviewed
 - Document why data is either rejected or accepted
 - Document status of data in RICE Emissions Database
 - Unacceptable
 - Acceptable upon condition that additional data is obtained
 - Acceptable

Summary of Next Steps for Emissions Subgroup

- Finalize emissions test plan
- Verify sites for emissions testing
- Evaluate engines that are not covered by the plan
- Determine if any HAP test reports included in ICR responses can be used to fill data gaps
- Apply T&M guidance to existing data in the RICE Emissions Database

ATTACHMENT VI

ECONOMIC ANALYSIS WORK GROUP PRESENTATION



Economic Analysis
Work Group
Data Development and Analysis
Schedule

Presented to ICCR Coordinating Committee
November Meetings
Houston, TX

Presented by Joe Mackell
Stakeholder Co-Chair
Glenn Sappie
Stakeholder Co-Chair (Alt.)
Tom Walton
EPA Co-Chair
Michael Gallaher
Contractor



Economic Analysis Work Group
Activities and Deliverables

| Description of Activity or Deliverable | Date |
|---|---------------|
| Representatives from Econ WG meet with Source WGs to discuss data requests for economic and benefits analysis | November 1997 |
| Source WGs provide preliminary data on population and activity | January 1998 |
| Econ WG reviews data available for analysis and selects appropriate methodology | February 1998 |
| Econ WG provides Source Work Groups with comments and suggestions for final data request | February 1998 |
| Econ WG presents analysis plan at the March CC Meeting | March 1998 |
| Econ WG receives final data from Source WGs to summarize | March 1998 |

2

Information Requested to Support the Economic and Benefits Analysis

- **Must Have Data** — Must be developed by the Source Work Groups to support the economic analysis.
- **Data Needed for Analysis** — Needed for the economic analysis, but assumptions or alternative sources could be developed by the Economic Analysis Work Group.

3

Must Have Data (I)

| Data Type | Description | Units |
|------------------------|--|--|
| Regulatory Alternative | Several regulatory alternatives may be developed that vary in the stringency of emissions reductions. | Cost and emissions data are needed for each regulatory alternative |
| Capital Costs | | |
| • Fixed | <i>Fixed capital costs</i> do not vary with emissions levels. May include capital expenditures, overhead allocations, property taxes, insurance, administrative fees, etc. | Annualized \$/year/plant |
| • Variable | <i>Variable capital costs</i> vary with emission. May include reduction in life expectancy of equipment. | \$/year/plant |
| O&M Costs | | |
| • Fixed | <i>Fixed O&M costs</i> do not vary with emissions levels. May include routine maintenance and labor, inspections, etc. | Annualized \$/year/plant |

4

Must Have Data (II)

| Data Type | Description | Units |
|--|--|---|
| Emissions Baseline | Baseline emissions are also needed because in many cases health benefits depend on the initial level of emissions (as well as the change), and/or the formation of secondary pollutants may not be a linear relationship. | tons/year and tons/time period |
| Population and Distribution | Costs and emissions data for model plants need to be weighted to estimate market impacts. In addition, the distribution of costs across plant size and markets is important. For example, impacts on small businesses and government entities need to be identifiable. | Weights for plants and ICCR population database |
| Description of Model Plant and Processes | For example, is waste heat used productively and is this affected by regulatory alternatives? | |
| Costs for New | If costs or emissions reductions for new sources are | |

5

Data Needed For Analysis

| Data Type | Description | Units |
|------------------------------------|--|--|
| Baseline | The baseline is used for comparing economic impacts of regulatory alternatives. It should reflect the state of affected industries (in the absence of ICCR regulations) at the anticipated time of implementing the regulation. In particular, changes in the ICCR population database that have occurred or are likely to occur in the near future need to be included in the baseline. | Historically, charts has been projected for implementation of regulatory |
| Parent Company Name and Employment | Used for SBREFA, Unfunded Mandates, etc. | |
| Sales of Parent | Used for SBREFA, Unfunded Mandates, etc. | |

6

Cost Estimates and Cost Distributions Are Used in the Economic Analysis to:

- Estimate total impact on society ⇒ need to link costs to national populations
- Determine who bears the burden — consumers or producers ⇒ need to link costs to markets
- Estimate small business impacts (SBREFA) ⇒ need to link costs to small businesses
- Estimate financial impacts and plant closures ⇒ need to link costs to individual facilities, combining costs from all source groups

7

Model Plants Are Only *One* Way to Develop Cost Estimates and Cost Distributions

- Model plant development encompasses a broad range of analysis approaches
 - ✓ No cookie cutter approach
- Two examples from previous EIAs
 - ✓ Coke ovens: Modeled every oven in the country
 - ✓ Degreasers and dry cleaners: Used vender sales to estimate population and distributions
- Common theme: Outliers are very important
 - ✓ Small entities
 - ✓ Old processes
 - ✓ Nontypical processes

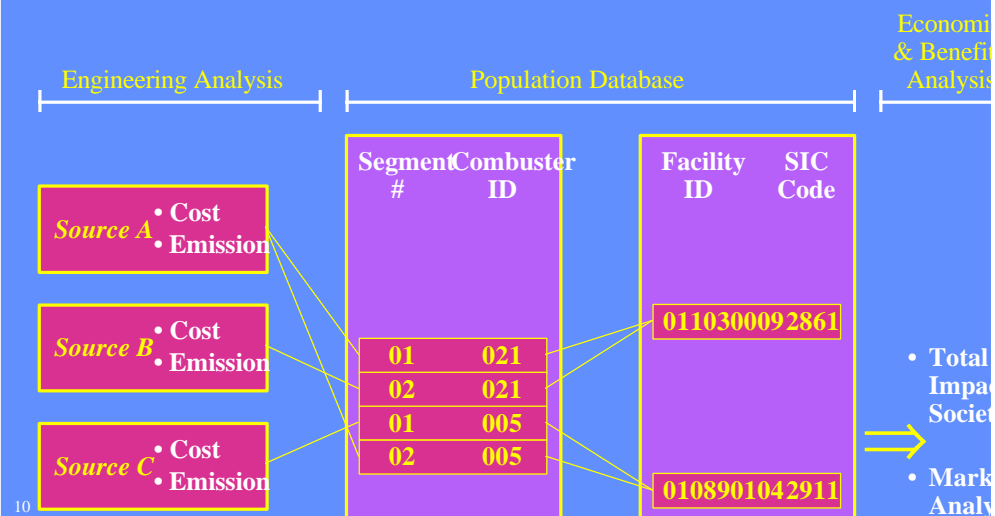
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Recommended Approach: Link Model Sources With ICCR Population Database

- Individual Model Sources
 - ✓ Finite (discrete) number of model sources are identified. These model sources should cover the full range of sources/impacts, including outliers.
 - ✓ Cost and emissions data are mapped back to the population database at the source level.
 - ✓ Costs can then be aggregated up to the facility or market level.
- Continuous Model Sources
 - ✓ Cost and emissions functions are used to map back to the population database based on parameters such as unit capacity.
- **Key issue will be verification of:**
 - ✓ Number of units
 - ✓ Distribution of units

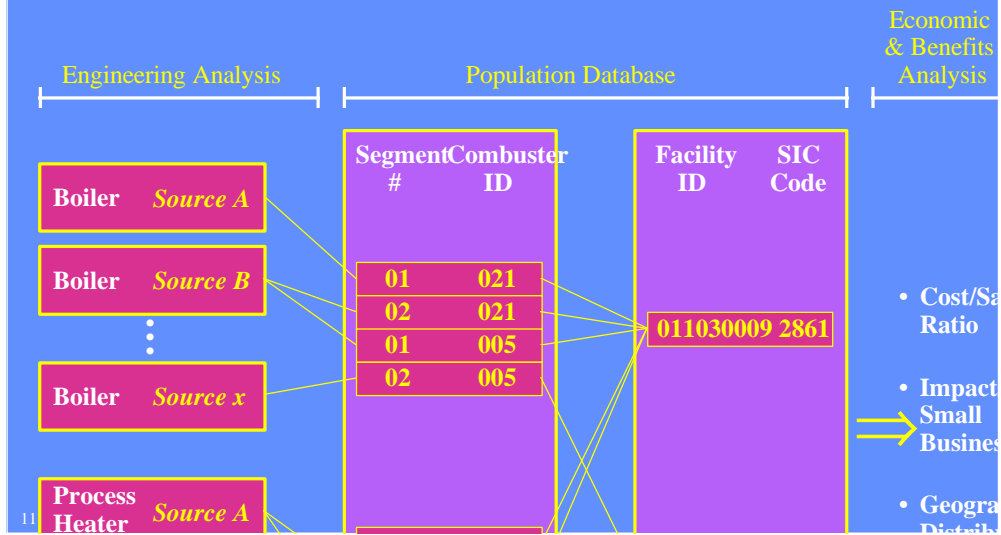
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Link Model Sources with ICCR Population Database

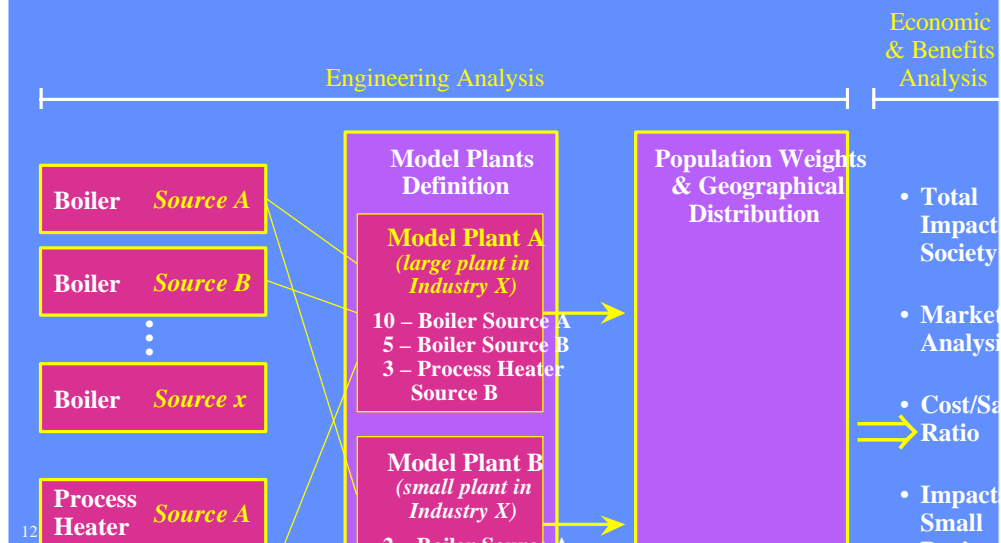


10

Combine Cost and Emission Estimates from All Source Work Groups



Alternative Approach to Linking with Population Database



ATTACHMENT VII

MICHAEL MILLIET'S PRESENTATION ON API AND EPA DATABASES

Comparison of EPA and API Population Databases

Mike Milliet
ICCR RICE Meeting
November 20, 1997

Presentation Overview

- API Database
 - Methodology
 - Response
 - Results
- EPA Database
- Comparison of API and EPA Databases
- Summary and Conclusions

API Database Methodology

- Gathered data on engine stroke, HP, type (lean/rich), and % rich burn with controls
- Engines \geq 150 HP plus turbines
- Data gathered by HP classes:
 - 150-300 HP
 - 301-500 HP
 - 501-750 HP
 - 751-1000 HP
 - >1000 HP

API/EPA Database Comparison

3

API Database Response

- Survey sent to 284 onshore oil and gas fields (SIC 1311) and 102 onshore gas plants (SIC 1321) in 19 states
- Response rate for SIC 1311 = 44%
- Response rate for SIC 1321 = 58%

API/EPA Database Comparison

4

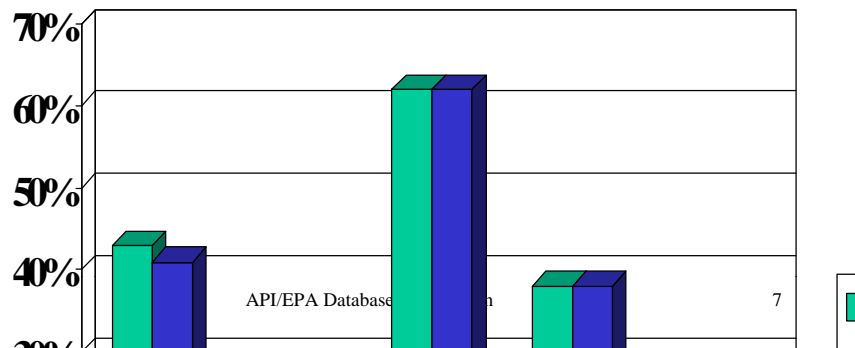
API Survey Results

| Engine Type | Number | %of |
|-------------|--------|-----|
| 4S Rich | 460 | |
| 4S Lean | 205 | |
| Total 4S | 665 | 5 |

EPA Database

- # of engines in database - 28,162
- # of engines with SIC 1311 1321 - 10,348
- SIC 1311 1321 fuel types
 - liquid - 883
 - gaseous - 9,465
- # of engines with stroke/burn/HP data - 857

API - EPA Comparison



Percent of 2S Engines by HP

| Engine Size | API |
|-------------|-----|
| 150-300 | 4.0 |
| 301-500 | 5.9 |

Percent of 4S Engines by HP

| Engine Size | API | |
|-----------------------------|------|---|
| 150-300 | 11.8 | |
| API/EPA Database Comparison | | 9 |
| 301-500 | 7.5 | |

Summary and Conclusions

- API tracks EPA data well
 - stroke information
 - type (rich, lean)
 - population by HP range
- API survey confirms population data for 37% of engines (SIC 1311 1321) in EPA database
- Some refinements for state by state variations may still be necessary after further review

ATTACHMENT VIII

**TASKS NECESSARY TO MOVE FROM MACT FLOOR AND TEST PLAN TO MACT
STANDARD FOR RICE**

TASKS NECESSARY TO MOVE FROM MACT FLOOR AND TEST PLAN TO MACT STANDARD FOR RICE

| Subgroup | Phase I Tasks | Phase II Tasks |
|--|--|---|
| Emissions Subgroup: Existing-Source MACT | 1. Determine subcategories - Possible drivers: * Feasibility of controls * “Achievable” emissions 2. Identify applicable control technology & availability - Determine durability / life / feasibility of controls - Is the technology available only for certain subcategories or sizes of engines? 3. Identify work practices 4. Evaluate cost-effectiveness - Determine effect of controls & work practices on HAP emissions (some pollutants ↑, some pollutants ↓, some pollutants stay the same) - Determine emission reductions achievable with control technology & work practices Determine costs for applicable control technology | 1. Determine which pollutants will be regulated under MACT 2. Develop the test protocol to go with the MACT standard (baseline & as-controlled) 3. Determine compliance monitoring, inspection, reporting and recordkeeping requirements 4. Determine size cutoffs |
| Population Subgroup: Existing-Source MACT | 1. Determine definition of “source” 2. Identify “typical” facilities to be regulated by MACT 3. Estimate total number of regulated sources 4. Develop model units - to be provided to Emissions Subgroup for evaluation of cost-effectiveness | 1. Determine national impacts |
| New-Source MACT | 1. Determine subcategories 2. Identify applicable control technology & availability - must be demonstrated in full-scale application 3. Identify work practices 4. Determine MACT floor for new sources - best performing similar source - address pollutant tradeoffs – what is the best performing similar source when there are multiple pollutants? | 1. Evaluate impact of standards for criteria pollutants at time MACT is promulgated 2. Define criteria for “new source” – if move an existing engine, is that a new source? 3. Determine if new source MACT should be equivalent to existing source MACT |

ATTACHMENT IX

OUTLINE OF BRYAN WILLSON'S NOV. 20 ICCR PRESENTATION ON
CSU'S ENGINES & ENERGY CONVERSION LABORATORY

Outline of Bryan Willson's Nov. 20 ICCR Presentation on CSU's Engines & Energy Conversion Laboratory

text only - all pictures deleted



Industrial Gas Engines at CSU's Engines & Energy Conversion Lab CSU Engines & Energy Conversion Laboratory

Mission: *To facilitate the development of new technologies for reducing emissions and fuel consumption from internal combustion engines*

Building

- 26,000 former ft² power plant,
- Building donated by City of Fort Collins
- Renovations from state Historical Society funds
- 1 mile from CSU campus
- 10 minutes from major hotels
- 1/4 mile from downtown Fort Collins
- 1.25 hours from DIA airport
- Heavy industrial construction
- Heavy duty foundations

CSU Engines & Energy Conversion Laboratory

Staffing

- 3-4 full-time staff
- 7-8 graduate students
- 10-15 undergraduate students

Facilities

- Large engine testbed(s)
- Automotive engine research facilities
- Extensive analytical equipment
- Fully equipped machine shop
- Ready access to CSU facilities
- On-site classroom & conference room

Field Testing of Large Engines

Remote sites increase difficulty of monitoring

- " Load dependent on pipeline conditions - likely to change over a 1 hour window: certainly over a day's testing
- " Incomplete data sets
- " Uncontrolled environmental conditions
- " Very few oxidation catalysts: expensive to install

Large-Bore Engine Testbed (LBET)

Funded by PRC International in '92

- " Operational in '93
- " Widespread industry support
- " Cooper-Bessemer
GMV-TF Engine
- 2-stroke cycle
- 4-cylinder
- 300 rpm
- original power rating: 440 hp

Water-brake dynamometer

- " Turbocharger simulator
- " Advanced controls & data acquisition

Autobalancing System

Cyl-cyl balance a major issue on 2-stroke cycle engines

- " 100 psi deviation considered "good"
- " Major impact on emissions & data quality
- " CSU engine equipped with Woodward Governor "AutoBalance" System
- " Automatic real-time balance based on cylinder pressure
- " Normally used for all testing for best quality data

Electric Turbocharger Simulator

Lysholm screw compressor

- " 300 hp induction motor
- " Variable frequency drive
- " Computer controlled exhaust restrictor
- " Allows simulation of a wide variety of engine configurations and boost levels

Data Acquisition

Woodward Governor Smart 3000

- " Custom designed for EECL
- " Now a Woodward product
- " Over 150 measured / controlled parameters
- " Can be used for other testbeds
- " Other data acquisition available

Environmental

Control

Control of temp. & humidity

- " Can heat or cool air
- " Colorado is dry; only need to add water
- " Up to 100% relative humidity
- " Steam or water injection
- " Used to quantify effects of humidity for PEMS models
- " Used to control humidity
- " ~30% effect on NOx and HAPs

Emissions Measurement

Criteria Pollutants

Rosemount NGA-2000

- " Full microprocessor control
- " THC - flame ionization
- " NOx - chemiluminescence
- " O₂ - paramagnetic
- " CO - NDIR
- " CO₂ - NDIR
- " Fully integrated into central data acquisition system

Emissions Measurement -

Hazardous Air Pollutants (HAPs)

Fourier Transform Infrared, Nicolet REGA system

- " Two sample trains
- " Possible 2nd FTIR
- " EPA 301 validation
- " 40 components:
 - NOx, SOx,
 - speciated HC
- " Primary HAPs:
 - Formaldehyde
 - Acetaldehyde
 - Acrolein
 - BTEX (maybe)

Data Integrity /

Quality Assurance

Daily calibration of load & emissions

- " Weekly calibration of other sensors
- " EPA protocol gases for criteria pollutants & HAPs
- " Autobalancing for 2-strokes
- " Environmental control

Combustion

Analysis

Kistler 6121 & 6125 piezoelectric transducers in each cylinder

- " Redline DSP for combustion analysis
- " Access to other sensors & CAS systems
- " Real time reporting of engine balance & combustion stability

High Speed Engines:

The Industrial Gas Engine Testbed

Waukesha 3521 - lean burn w/ oxidation catalyst

- " White - Superior 6G825 - "rich-burn" w/ NSCR catalyst

- " Access to extensive
LBET infrastructure
Environmental control
 - _ 5-gas emissions bench
for criteria pollutants
 - _ FTIR for HAPS

Torque / Speed: #1, #2, #3, #4

Torque / Speed / A/F: #7, #8

Load Control:

- 2-Strokes: Water-brake dynamometer
- 4-Strokes: Eddy-current dynamometer

Speed Control:

- 2-Strokes: Fuel governing
- 4-Strokes: Air throttling

Air-Fuel Ratio: #1, #5, #6

2-Stroke

- Fix load, vary air manifold pressure (boost) with turbocharger simulator
- _ Fix boost level, vary load

4-Stroke Lean Burn

- Vary carburetor setting, electronic feedback from wide range O₂ sensor (UEGO)

Air Manifold Temp: #1, #9, #10

Jacket Water Temp: #1, #11, #12

Boiler for hot water supply

- " New (to us) \$50K atmospheric cooler for cold water supply
- " Capabilities for closed-loop control of air & water temp on 2-stroke
- " Can added closed-loop control for 4-strokes

Question: Testing for humidity?

Ignition Timing: #1, #13, #14

Balance Sensitivity: #1, #15, #16

Ignition Timing

- Custom ignition unit allows wide variation of timing for 2-strokes
- _ Manufacturer has committed to wide-ranging unit for 4-strokes

Cylinder Balancing

- Custom autobalance unit allows programmable imbalance on 2-strokes
- _ 4-stroke A/F variation significant: could measure & control w/ air bleed

Catalyst Issues

Potential Variation

Additional data points for improved characterization

- " 2 FTIR system will allow rapid characterization of FTIR-measured species
- " Holdup will be GC-MS, PM, & Carb 429 measurement
- " Potential for increased resolution (more data points) with FTIR only
- " Assess evaluation of humidity

Catalyst Testing Issues

Catalyst age

- Can age catalyst in lab - expensive
- Can age catalyst in field - most realistic
- Potential aging site identified

Catalyst temperature

- Controlled w/ placing of catalyst housing

Catalyst manufacturer

- Must be selected to ensure compatible housing
- Must have access to aged catalysts

Engine condition

- Normally, all testing done with engine maintained according to "best practice"

Schedule

4-Stroke Installation

- Final stages of contracting
- Nominally, 6 month installation for June 1 test start
- Installation can be expedited

Catalyst Installation

- Potential to proceed under GRI HAPs mitigation project, negotiations just beginning

2-Stroke Low Speed

- Catalyst housings can be installed 1st qtr of '97
- Engine available after housing installed

Test Advisory Committee (TAC)

Several technical issues remain with significant potential impact

- " Recommend formation of test advisory group
- " Perhaps an extension of emissions subgroup
- " TAC site visit desirable; potential to coordinate with EPA visit

Costs

Need to determine project structure

- Prime contractor - CSU or other?
- Identify overall project manager - CSU or other?
- Contractor for GC-MS, HPLC, & particulate sampling?
- EPA oversight role?

Within costs discussed to date

ATTACHMENT X

**PETER HILL'S MEMO TO SAM CLOWNEY
REGARDING DIESEL ENGINES TO TEST**

MEMO

To: Sam Clowney, RICE Workgroup
From: Peter Hill, U.S. Navy
Re: Testing of Diesel Oil Fired RICE
Date: 11/20/97

Navy owned engines that may be available for ICCR emissions testing, subject to agreement by the owning/operating facility, include:

| CAPACITY | MFR | MODEL | EMISSIONS TYPE | CONTROLS |
|---------------|---------|---------|-------------------|----------|
| 750kW/4.16kV | Cummins | QST30 | 4stroke/t.c. | no |
| 750kW/4.16kV | Cummins | KTA2300 | 4stroke/t.c. | no |
| 1500kW/4.16kV | EMD | 645E4 | 2stroke/t.c. | no |
| ~1500-1800kW | CAT | 35__ | 4stroke/t.c. | unknown |

- All units are generator drive. (Navy has portable load banks that may be available for testing.)
- The Cummins QST30 units are being assembled; they could be available for testing by February 1998.
- The Cummins KTA2300 and EMD units are not presently in use; they are skid mounted/housed portable units, located in Port Hueneme, California.
- The CAT units are installed at a U.S. Navy facility in Virginia; their availability for testing is unknown at this time.